L/2 at the point where further rotation of the elbow is prevented by contact of the forearm with the bicep.

An exercise session then consists of a series of oscillating movements with the forearm between the relaxed state approximately defined by distance 'L' and the compressed state defined approximately by the distance 'L/2', or alternatively defined as rotation of the forearm relative to the upper arm between a first angle 'α' and second angle equal to or less than 'α/2'.

Normally an inexperienced user will start an exercise regime with the compression of spring 224 set to its maximum installed length (thus at its minimum outwardly urging force), gradually increasing the compression as the musculature of the upper arm develops.

In a further preferred embodiment the should and wrist yokes are adapted to be detachable from the device to allow the yokes to be replaced by suitable handgrips. In this configuration the device may be used to exercise the shoulder muscles by grasping the device by the handgrips, one in each hand, and applying compressive force.

EXAMPLE

Electrodes were positioned over four muscles (biceps brachii, medial triceps brachii, petoralis major and latissimus dorsi) of one male subject to measure activation levels during use of the exercise device.

- Test A: The first task that was performed involved elbow flexion while the shoulder was flexed to maintain a horizontal position of the upper arm. In this

position, while the device was held fin the hand and pressed down onto the shoulder, muscle activation of the biceps brachii was monitored.

- Test B: For the next task the subject positioned his arm by his side and adducted the shoulder against the resistance of the exercise device. The exercise device was held in the hand and squeezed against the thigh, muscle activation of the pectoralis major, triceps brachii (medial head) and latissimus dorsi were monitored during this task.
- Test C: The final task involved the horizontal adduction of the shoulder. Both arms were flexed and held in a horizontal position in front of the subject while the exercise device was pushed together between the hands. Muscle activation of the pectoralis major, triceps brachii (medial head) and latissimus dorsi were monitored in this test.

For all tests two static and two dynamic trials were performed and in each case the average activation of the two trials was calculated. First A was performed with a light and a heavy spring while only a light spring was used for Tests B and C.

Muscle activation levels were normalized to a percentage of the subject's isometric (static) maximal voluntary contraction (MVC) against an immobile load for 3 seconds. Normalization of the trial data involved dividing the average trial data by the MVC and then multiplying by 100 to produce a percentage of the MVC. In all tests the MVC was performed in the same position as the task, however for Test A an additional MVC was performed at 90° flexed elbow position to compare the test results with a common biceps brachii flexing exercise position.

RESULTS

Table 1 lists the muscle activation level results as a percentage of MVC for each test.

Table 1. Results for tests A,B and C. For test A the "standard" data indicated the comparison with the MVC taken in the same position as the test and "90^o" represents the comparison with the MVC taken at 90^o of flexion.

Test	Spring Resistance	Static (%MVC)		Dynamic (%MVC)	
MVC		Standard	90^o	Standard	90^o
A – Elbow Flexion	Light Heavy	30.5 217.8	25.2 180.0	96.2 165.7	79.5 137.0
Test	**Muscles**	**Static (%MVC)**		**Dynamic (%MVC)**	
B – Adduction	Triceps Brachii (medial head) Latissimus dorsi Pectoralis major	96.0 187.5 83.5		71.0 160.3 68.9	
C – Horizontal Adduction	Triceps Brachii (medial head) Latissimus dorsi Pectoralis major	14.3 45.4 149.5		14.1 55.6 121.7	

Overall, the results indicate that apart from the low activation level of the triceps brachii in Test C all muscles have shown a substantial level of activation in each test, see Table 1. In Test A (elbow flexion) the use of the light spring has shown a reasonable level of muscle activation. The use of the heavy spring has produced much greater activation, while performing dynamic activity has had a varied effect. During Test B (shoulder adduction), the latissimus dorsi has shown substantially greater activity than the other two muscles. The static trials have produced greater activation than the dynamic trials for Test B. In Test C, the pectoralis major has shown much greater activity than the latissimus dorsi and triceps. In this test, the differences between the static and dynamic results carried once again.

SUMMARY

During an elbow flexion exercise the spring loaded exercise device has show biceps brachii muscle activation that reaches and sometimes exceeds a level equivalent to a standard 90° flexed elbow position action. During shoulder adduction, activation of the latissimus dorsi was the dominant muscle activated, while during horizontal adduction activation of pectoralis major was dominant.

The above describes only some embodiments and uses of the present invention and modifications and adaptations, obvious to those skilled in the art, can be made thereto without departing from the scope and spirit of the invention.